DOCUMENT RESUME

ED 274 071 EA 018 832

AUTHOR Schulz, E. Matthew; And Others
TITLE The Association of Dropout Rates with Student Attributes.
PUB DATE Apr 86
NOTE 17p.; Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Grade Placement; *Dropout Rate; Grade Repetition; Predictor Variables; Reading Achievement; Secondary Education; *Student Characteristics
IDENTIFIERS Chicago Public Schools IL

ABSTRACT

Over 75 percent of the students enrolling as freshmen in Chicago's public high schools during 1978, 1979, and 1980 made up the sample for a study of the student characteristics that affected dropout rates. The characteristics assessed were reading achievement (as indicated by eighth-grade standardized test scores), age at enrollment in high school, sex, and race, as well as interactions among these variables. Loglinear and multiple regression analyses were used. Reading achievement, high school entry age, and their interactions accounted for 80 percent of the variation in dropout rates. The other 20 percent of the variation was accounted for by race and gender. High dropout rates among Hispanics and Blacks can be attributed to low reading achievement and the effects of being overage. When reading achievement and age are controlled for, Whites appear as likely to drop out as Blacks or Hispanics. Retention of students in primary grades appears to increase the dropout rate: the rate for overage students is 13 percentage points higher than that for normal-age students with identical reading scores. Dropout prevention policies should focus on raising reading scores and keeping students' ages at entry down. Studies to identify additional alterable variables should also be conducted. (PGD)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

E. Matthew Schulz

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED274071

# The Association of Dropout Rates with Student Attributes

E. Matthew Schulz
Ronald Toles
Dr. William K. Rice, Jr.
Dr. Irving Brauer
Jaqueline Harvey

Department of Research and Evaluation
Chicago Board of Education
1819 West Pershing Road
Chicago, IL 60609

Annual Meeting
of
The American Educational Research Association
April 16-20, 1986
San Francisco, California

EA 018 832

The Association of Dropout Rates with Student Attributes

## INTRODUCTION

The high school dropout rate has become a critical problem in the public school systems of large cities. Over 40 percent of students enrolling as freshmen in the Chicago public high schools during the years 1978 to 1980 dropped out (Hess and Lauber, 1985). The present study was undertaken to assess the association of the dropout rate with attributes of these students.

Two of the attributes, reading achievement (RGE) and age upon entry to high school (hereafter referred to as entry-age), are of particular interest. These attributes are alterable. They may be affected by system-wide policies and by specialized dropout prevention programs.

The other attributes, race and sex, are treated differently in our study because they are not alterable. They are of no use, by themselves, as explanatory variables in dropout studies. If race and gender are associated with dropout rates, one can only conduct further research to find alterable variables that mediate this association. Only by directing the search for alterable, underlying variables, can the association of race or gender with dropout rates be of any practical value in dropout prevention.

The retention of students in primary grades whose academic progress is considered inadequate for higher level coursework is one policy that is likely to affect the alterable student attributes considered in this study. Presumably, retention increases students' achievement upon their eventual entry to high school, but increases their entry-age as well. The dropout rate decreases with achievement, but increases with entry-age (Hess and Lauber, 1985). One objective of this study is to determine what the net affect of retention policies on the dropout rate is likely to be.

DATA SOURCE

Approximately 98,000 students enrolled as freshmen in the Chicago public high schools during the 1978 to 1980 period. Two groups of students were drawn from this population. One group consisted only of students who enrolled in 1978. The other group consisted of students who enrolled anytime during the entire 1978 to 1980 period. Sample sizes were reduced due to the omission of some groups of students, such as American Indians, who were too few in number to yield reliable results for their group. Students with missing data were also deleted from the study. The final sample sizes were approximately 26,600 for the 1978 sample, and 77,000 for the 1978/80 sample.

The samples included only students who had either graduated or dropped out. Leave status was checked after 6 years for students who enrolled in 1978, and after 4 years for students who enrolled in 1979 and 1980. Students who had transferred out of the public school system (approximately 8 percent) or who were still active (less than 1 percent) were omitted from the study.

The demographics of the total number (33,142) of entering students in 1978 were as follows: 50.8% male, 49.2% female; 3.2% entry-age of 13 or less, 71.3% entry-age of 14, 22.5% entry-age of 15, 3.0% entry-age of 16 or more; 0.1% American Indian, 1.9% Asian, 62.6% Black, 21.4% White; 61.9% in reading stanine 4 or lower, 26.5% in reading stanine 5 or higher, and 11.6% with no reading achievement score indicated. Reading achievement was based on the Iowa Tests of Basic Skills scores from the students' eighth-grade year.

METHODS

Both loglinear and multiple regression programs (SAS LOGIST and GLM) were used to assess the association between student attributes and dropout rates in the 1978 sample. Students were the unit of analysis. The dropout variable was dichotomous: '0' if the student graduated, '1' if the student dropped out. Reading achievement was a continuous, independent variable. Race was entered either as a class variable, or as a set of indicator (0/1) variables, depending on the analysis. Indicator variables were used to designate gender (1 = males) and entry-age (1 = overage). Overage students had an entry-age of 15 or more years. The probability that a student will dropout, as determined by the regression model, is the student's dropout "potential".

The GLM procedure was used to derive the sequential sums of squares for effects as they were added to the model. Reading achievement, entry-age, and the interaction of reading achievement and entry-age were entered first, followed by gender, race, and all interactions.

The 1978 to 1980 sample was divided into normal-age (13.8 to 14.7 years) and over-age (14.8 to 15.7 years) groups. Students were then subgrouped into RGE intervals, 0.5 grade levels wide. The dropout rate was computed for each subgroup. This was done over a restricted range of RGEs because group sizes at extreme levels of RGEs were too small to yield reliable estimates of dropout rates. Weighted linear regression analyses were conducted on the data. The weighting variable was the square root of group size. Dropout rate was the dependent variable and the midpoint of RGE intervals was the independent variable. Regression analyses were also performed separately for Whites, Blacks and Hispanics.

RESULTS

There were no notable differences between the logistic and ordinary least square regression models in terms of predictive accuracy and the relative size and significance of regression coefficients. Both methods produced an R-sqaure of approximately 0.48, based on the full model. Dropouts and graduates could be identified with 70 percent accuracy. The results from the ordinary least squares regression analysis will be presented here.

Table 1 shows the sequential sums of squares attributable to student attributes. The full model accounts for slightly less than half of the total variance in the dropout variable. The total sum of squares is 10,994 and the model sums of squares is 5236; the R-square is thus about 0.48. The F-value for the full model is 951, with 26 and 26,239 degrees of freedom, ($p<.0001$).

Most of the variation in the dropout variable is accounted for by reading achievement (RGE), entry-age, and the interaction of RGE and entry-age. When these variables are entered first into the regression equation, they accumulate 4141 of the 5236 sums of squares attributable to the model. They account for over 80% of the predictable variance in the dropout variable. The F-values for these effects are highly significant ($p<.0001$).

Gender and race account for significant amounts of variance in the dropout variable even after the effects of RGE and entry-age are removed. The F-value for Race, with 3 degrees of freedom (4 races) in the numerator, is 1332 ($p<.0001$). The F-value for gender, with 1 d.f. in the numerator, is 1066 ($p<.0001$). Together, main effects of gender and

race account for about 20 percent of the predicted variation in the dropout variable.

The association of dropout rates with RGE and entry-age is illustrated in Figure 1. Dropout rates are plotted against RGE separately for normal-age and overage students. Tables 2 and 3 supplied the data for these plots. Weighted regression analysis of dropout rates on the midpoints of RGE intervals produced an R-square of 0.99 for the normal-age group and 0.97 for the overage group. Thus, there is a linear relationship between reading achievement and dropout rates.

The effect of entry-age on dropout rates is evident from the separation of the two lines in Figure 1, and from the comparison of the dropout rates of normal-age (Table 2) and overage (Table 3) students who have the same RGE. On average, the dropout rate of overage students is about 13 percentage points higher than the dropout rate of normal-age students with the same RGE. Students with an RGE of about 5.7, for example, have a dropout rate of 46.8 percent if they are normal-age, or 60.6 percent if they are overage.

The effect on dropout rates of the interaction of RGE and entry age is apparent from the difference between the slopes of the regression lines in Figure 1. The slopes are -6.66 and -6.04 for normal-age and overage students, respectively. As entry-age increases, dropout potential becomes less dependent on RGE. The t-statistic for the difference between slopes is 1.98, ($p<.05$). This significance level is far below the significance level of the corresponding F value in Table 1, probably because in the 1978/80 sample the distributions of entry-age and achievement were restricted, and achievement groups were the unit of

analysis in the 1978/80 sample.

According to the regression equations derived from Tables 2 and 3, the RGE predicting a 50% chance of graduating (a 50% dropout rate) is 5.22 for normal-age students and 7.45 for overage students. This is a difference of 2.23 grade levels. The difference is about the same among Blacks, Whites and Hispanics. The difference is 2.82 grade levels among Whites, 2.16 grade levels among Blacks, and 2.33 grade levels among Hispanics. The data of Asian students was not analyzed separately.

The effects of the interactions of student attributes on the dropout variable are small in comparison to main effects. Apart from the interaction of RGE and entry-age, the sums of squares due to interaction effects amount to only 22 of the 5236 model sums of squares (Table 1). Several of these interaction effects, however, did achieve statistical significance. The parameter estimates for these effects, along with the parameter estimates for the main effects of race and gender, are shown in Table 4.

The parameter estimates and standard errors in Table 4 represent effects of the variables when they are the last to enter the regression equation. Parameter estimates of this kind are not shown for RGE, entry-age, and the interaction of RGE and entry-age because these variables enter the regression equation first, a priori.

Attributes associated with greater dropout potential have higher positive coefficients in Table 4. Hispanics have a significantly lower dropout potential (0.70) than Whites (0.85) or Blacks (0.84). The dropout potential of Asians (0.47) is significantly less compared to any other race. The dropout potential of males (0.11 for gender) is

significantly greater than the dropout potential of females.

The increase in dropout potential with entry-age is greater among Blacks than among other races. The coefficient in Table 4 for 'overage Blacks' is +0.057 ($p<.0004$).

Dropout potential is more strongly associated with RGE among Whites and Blacks than among Asians and Hispanics. Coefficients for the interaction of race with RGE were -0.022 for Blacks and -0.016 for Whites ($p<.0001$, both coefficients). These coefficients mean that the regression slope of dropout rate on RGE is steeper among Whites and Blacks. This stands to reason, since RGE is dependent upon exposure to written English, and a larger proportion of Chicago's Black and White populations than of Chicago's Hispanic and Asian populations are exposed to written English from birth.

The difference between the males' and females' dropout potential is not as great among Whites as among other races. In general, males are much more likely to dropout than females. The coefficient for gender is 0.11, ($p<.0001$). The coefficient for White males (-0.066) reduces the 'net' coefficient for gender to +0.044 among Whites.

DISCUSSION

Reading achievement and entry-age, in contrast to race and gender, can account for most of the predictable variation in students' dropout rates. When RGE, entry-age and their interaction are entered first in the regression analysis of the dropout variable, they account for eighty percent of the modeled variance. Race, gender, and interactions involving race and gender accounted for the remaining twenty percent of the modeled variance.

These findings are indicated by the tabulation of dropout rates, RGE and entry-age by race. In the 1978 sample, the dropout rate was 46.9% among Hispanics, 45.1% among Blacks, 34.5% among Whites and 19.4% among Asians. The percent of students with low reading achievement (RGE in stanine 4 or less) in the 1978 sample was 78% for Blacks and Hispanics and 42% for Whites and Asians. The percent of overage students in the 1978 sample was 31% for Hispanics, 25% for Blacks, 23% for Asians and 15% for Whites. From these figures, the high dropout rates among Hispanics and Blacks can be attributed to low reading achievement and the effect of being overage.

It is not clear, however, just what the effects of race (or gender) are after controlling for RGE and entry-age. The regression analyses in this study allow these effects to be estimated. Of particular importance, it is seen that Whites are at least as inclined as Blacks and Hispanics to dropout when differences in reading achievement and entry-age are removed. This suggests that the dropout rate among Blacks and Hispanics could be as low as that of Whites if the reading achievement of these minority races could be made comparable to that of

Whites, and if their entry to high school were accelerated.

Rather than allowing race or gender to continue to account for significant differences in dropout potential, effective program planners should attempt to discover additional alterable variables that dispose males and students of particular races to dropout, and change these variables. Reading achievement and entry-age are good examples of variables that vary with race and are associated with dropout rates. Additional variables with similar usefulness might include students' attitudes toward school, and students' perception of the relevance of high school curricula to their futures.

Our results suggest that the retention of students in primary grades increases the dropout rate at the high school level. Overage students are far more likely to dropout than normal-age students. The dropout rate is about 13 percentage points higher among overage students than among normal-age students with identical reading achievement scores. Overage students must have reading scores over 2 grade levels higher than normal-age students in order to have the same chance of graduating. The rate of progress of low-achieving students is less than one grade level per year by definition. A year of remedial study cannot possibly increase such students' achievement by over 2 grade levels.

We recommend dropout prevention policies that will 1) increase students' reading achievement before entry to high school, without retention, and 2) promote the entry of students into high school at an earlier age. In addition, studies should be undertaken to identify additional alterable variables that dispose males and students of particular races to drop out.

## References

Hess, G. Alfred, Jr., and Lauber, Diana, (1985). Dropouts From the Chicago Public Schools. Chicago Panel on Public School Finances. 53 West Jackson Boulevard, Suite 1730, Chicago, IL 60604.

TABLE 1: Sequential Sums of Squares Due to Student Attributes
Dropout Variable 0/1 From 1978 Sample

| Student Attribute | D. F. | Sequential Sum of Squares | M.S.E. | F-value |
|---|---|---|---|---|
| RGE | 1 | 3244 | 3244 | 15302 |
| Entry Age | 1 | 729 | 729 | 3438 |
| RGE * Entry Age | 1 | 168 | 168 | 793 |
| Gender | 1 | 226 | 226 | 1066 |
| Race | 3 | 847 | 282 | 1332 |
| Other | 19 | 22 | 1.15 | 5 |
| Model SS | 26 | 5236 | 202 | |
| Error SS | 26,239 | 5558 | 0.21 | |
| | | 10794 | | |

Figure 1

PLOT OF DROPOUT RATE AGAINST READING ACHIEVEMENT
ENTERING FRESHMEN, 1978 to 1980

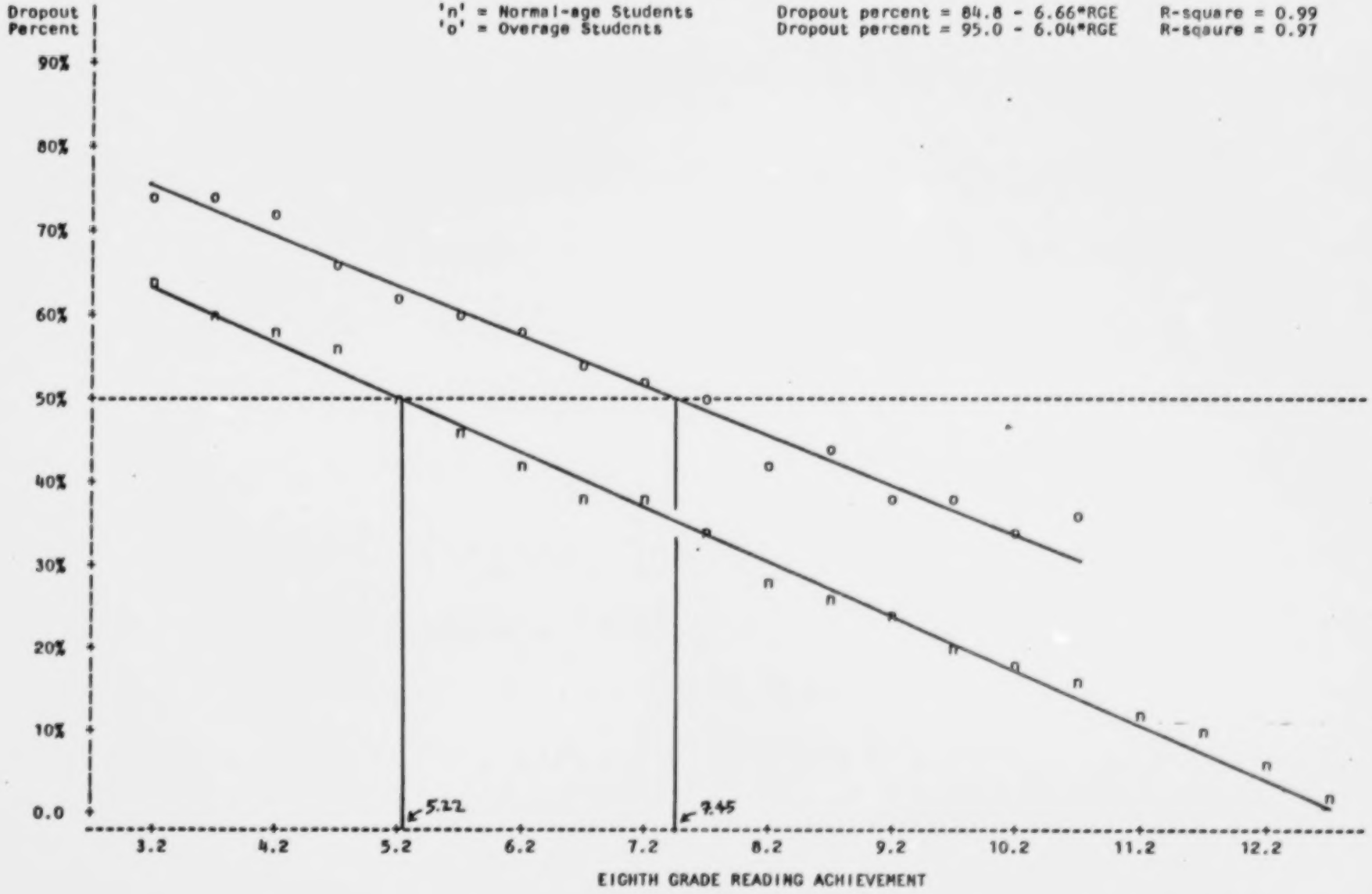

Table 2: Dropout Rate by RGE among Normal Age Students: 1978 to 1980

| RGE Midpoint | Dropouts plus Graduates | Dropouts | Dropout Rate (%) |
|---|---|---|---|
| 3.2 | 362 | 232 | 64.1 |
| 3.7 | 614 | 372 | 60.6 |
| 4.2 | 1282 | 737 | 57.5 |
| 4.7 | 1674 | 946 | 56.5 |
| 5.2 | 2650 | 1351 | 51.0 |
| 5.7 | 3396 | 1582 | 46.6 |
| 6.2 | 4216 | 1773 | 42.1 |
| 6.7 | 4593 | 1789 | 39.0 |
| 7.2 | 5556 | 2088 | 37.6 |
| 7.7 | 4992 | 1714 | 34.3 |
| 8.2 | 4626 | 1330 | 28.7 |
| 8.7 | 4179 | 1056 | 25.2 |
| 9.2 | 3853 | 908 | 23.6 |
| 9.7 | 2705 | 560 | 20.7 |
| 10.2 | 2361 | 414 | 17.5 |
| 10.7 | 1775 | 288 | 16.2 |
| 11.2 | 1212 | 149 | 12.3 |
| 11.7 | 364 | 38 | 10.4 |
| 12.2 | 277 | 16 | 5.8 |
| 12.7 | 86 | 2 | 2.3 |

Table 3: Dropout Rate by RGE among Overage Students: 1978 to 1980

| RGE Midpoint | Dropouts plus Graduates | Dropouts | Dropout Rate (%) |
|---|---|---|---|
| 3.2 | 536 | 399 | 74.4 |
| 3.7 | 766 | 564 | 73.6 |
| 4.2 | 1358 | 979 | 72.1 |
| 4.7 | 1445 | 949 | 65.7 |
| 5.2 | 1800 | 1132 | 62.9 |
| 5.7 | 1812 | 1096 | 60.5 |
| 6.2 | 1725 | 985 | 57.1 |
| 6.7 | 1428 | 759 | 53.1 |
| 7.2 | 1450 | 753 | 51.9 |
| 7.7 | 1010 | 515 | 51.0 |
| 8.2 | 681 | 285 | 41.9 |
| 8.7 | 434 | 195 | 44.9 |
| 9.2 | 276 | 106 | 38.4 |
| 9.7 | 189 | 70 | 37.0 |
| 10.2 | 107 | 36 | 33.6 |
| 10.7 | 62 | 22 | 35.5 |

Table 4: Parameter Estimates for Effects of Student Attributes On Dropout Potential: 1978 Sample.

| Student Attribute | Parameter Estimate | Std. Error of Estimate |
|---|---|---|
| Gender = Male | 0.11 | 0.006 |
| Race = White | 0.85 | 0.028 |
| Race = Black | 0.84 | 0.016 |
| Race = Hispanic | 0.70 | 0.028 |
| Race = Asian | 0.47 | 0.041 |
| RGE * Whites | -0.016 | 0.004 |
| RGE * Blacks | -0.022 | 0.004 |
| Black and overage | 0.057 | 0.016 |
| White and male | -0.066 | 0.014 |